University of Gondar

Faculty of business and economics

Economics department

Impacts of ISO14001 certification on profitability and society benefits (case study of ELICO, Addis Ababa, Ethiopia)

A Thesis Submitted in Partial fulfillment of the Requirements for Degree of Masters of Sciences in Economics

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Approved by board of examiners

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Advisor signature

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Examiner signature

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The lord is my shepherd, I have all I need. Even if it is unthinkable to compare what he have done for, I would like to give my whole appreciation and acknowledgment to my savior and provider GOD. My God always guide me in his path and help me in all ups and downs of my life. I have no words to thank you.

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ACRONYMS

CPO- cleaner production option

DID – difference in difference

ECPC – Ethiopian cleaner production center

ELICO- Ethio-leather industry private limited company

EMR – environmental management representatives

EMS – environmental management system

ISO – international standard organization

MEF- ministry of Environment and Forest

NBE – national bank of Ethiopia

NBR –Brazilian administration review

NGOs – non- governmental organizations

OLS – ordinary least square

SPSS- Statistical Package for Social Sciences

TQM – total quantity management

Abstract

Many companies around the world are trying to maximize their benefit taking their surrounding environment in consideration. From different types of environmental management methods, ISO14001 certification is one of them. ISO14001 certification has not only environmental benefit, but it has also indirect financial benefit since it believed that environmental concerned companies have better market share than others. Considering this, the main focus of this research is investigating whether ISO14001 certification has impact on profitability or not taking ELICO as case study. To investigate this, both primary and secondary data were used. The source of primary data was self- administered questioner and secondary data was collected from ELICO, NBE and Addis Ababa tannery data records. In this research both econometrics OLS multiple regression analysis by applying DID impact assessment method using ELICO as treatment and Addis Ababa tannery as control group and descriptive statistics was used. The result of the investigation shows that ISO14001 EMS has positive impact on profitability and it is recommended to the certified companies to apply it in more effective way to have better environmental and financial benefits.

Key words**:** Environmental management, ISO14001 certification and profitability.

CHAPTER ONE

1. Introduction

1.1 Background of the study

ISO14000 series is a set of international standards that contains twenty environmental management standards (EMS) designed to help organizations to established management processes for controlling and improving their environmental performance. The most important ISO 14000 standards is the ISO 14001 certification. It provides framework for establishing EMS and it is the only standard of ISO of 14000 series that can be used in certification (Babakri et al, 2003). ISO14001 standard is internationally recognized. Its Implementation helps the firm to mitigate and continuously improve its negative environmental impacts and improve their financial performance (McGuire, undated). ISO 14001 is most popular voluntary environmental standard in the world.

Over the last thirty years, human activities lead impact on Earth's resource. To reduce this impact now days businesses have begun to monitor their environmental impacts. Historically, managing environmental issue was not part of company's strategic decision making process, but now businesses realized that environmental management is a critical aspect of overall business strategy and success. Today, an EMS is an integral part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures and process. EMS ranges from informal components of corporate management systems focused on environmental compliance to formal management system designed to comply with the ISO14001 standard or other EMS standards (Edward et al, 1999).

The environmental degradation grew in the last few decades and it affects every corner of the world. Great part of the pollution has origin in the organization at the time of their production process and distribution of their goods and services. Since this problem originated from industries production activities, the solution

for this problem is in the hands of the industries environmental management system (Oliveira et al, 2007).

One of this method is adopting ISO 14001 certification and implementing it with integrated to other environmental protection rules and regulations to decrease their pollution negative impact on their surrounding environment. ISO14001 also help firms to increase their profit performance (profitability) through expanding their export volume through sale of more products at foreign currency. Because of this reason thousands of industries worldwide have certified to international organization for standardization ISO14001. But it is not the only reason that makes Companies certified. The other reasons are the following. The first reason is market pressure (Darnall, 2006). The second reason is that achieving ISO14001 certification requires a significant commitment of resource utilization and it leads better resource management (Darnall et al., undated). The third reason is organizations that certify to ISO 14001 may able to enhance their environmental image (Bansal et al., 2003).

ISO certification has also its disadvantage as (Suhaiza et al, undated) stated it has high cost of implementation, it may result in reduction of resource away from investment and added bureaucracy during its implementation. But it is recommended to the firms to acquire the certification since its certification social and economic benefits are high. ISO14001 certification creates socially responsible industries. Also ISO 14001 can be utilized by the number of industries or companies as large as the industry fulfills the standard's goals. For this reason ISO14001 certification has the potential to affect more firms globally and affect more facility operations than any other environmental certification program (Sabs, 2004).

In our country, many industries are acquiring ISO certificates that help them to manage their surrounding environment, to interact better with their customers internationally and to increase their revenue by creating a competitive advantage.

Ethio-leather industry (ELICO) is one of them and it is also selected for this study.

ELICO was established in August 1997 as a leather wing of MIDROC Ethiopia to manage and operate two tanneries, leather garment and leather goods manufacturing factory that were acquired from the Ethiopian privatization agency. The Industry has three Operating Units, namely, the Gloving and Hides Unit, Goat Suede and Shoe Leather Unit and Leather Goods and Garment Unit. ELICO has achieved process management standards and received ISO 9001-2008 and ISO 14001 certification. This study had focused on ISO14001 certification effectiveness in ELICO.

1.2 Statement of the problem

A healthy natural environment provides us with the resource needed to sustain life, Such as food, clean water, medicine, raw materials, and fresh water and so on. It also Maintain biodiversity and resilience of the ecological system. However, around the globe this natural capital is being spent faster than it can be renewed (MEF, 2007). There are many ways that helps to keep our environment healthy. Especially industries can bring fundamental change in case of environmental protection since they are the main source of pollution. To do this, industries can take different measures; one of these measures can be receiving ISO certification and implementing it properly.

ISO14001 is a standard related to environmental management that exists to help organizations to minimize their production process negative effects on the environment. The main purpose of certification of ISO14001 is improvement of environmental performance by means of environmental management; usually through formal establishment of EMS. The environmental management system (EMS) implementation in manufacturing sector in Ethiopia is increasing currently. The reason for this is that ISO certification has many benefits to one certified organization. Some of the benefits of the certification are increase in the

volume of sale and market share; again this leads better profit performance, good customer relation especially with foreign customers (Wilcox, 2007).

Many studies show that certification of ISO 14001 for different companies in different countries leads environmental performance and better profit performance than before certification. In Japan manufacturing sector, ISO 14001 certification spurs reductions in natural resource use and waste emissions (Arimua et al, 2008). Also ISO14001 certification causes U.S.A air polluters to cut their emissions by more than uncertified plants and it helps them to increase their revenue (profit) (Potoski and Prakash, 2005). In addition to this, adoption of ISO14001 certification in Malaysian industries shows that ISO 14001 certification has positive impact to firms' performance, specifically on perceived economic impact (profit performance), perceived environmental impact and perceived customer satisfaction (Zailani et al, undated).

On the other hand, using panel data for sample of Canadian pulp and paper plants (Barla, 2007) founds that ISO14001 certification is correlated with increase in some types of water pollution it decreases revenue of the company because of high cost of certification and implementation. Castro (2006) analyzed the influence of an environmental management system certified according to NBR ISO 14001:2004 on the market value of Brazilian firms and did not find any increase in the market value of these companies. As can be seen, there is no consensus on the importance of obtaining certification according to the NBR ISO 14001:2004 standard and the possible financial impacts, particularly firm profitability. In Ethiopia case, there is no study that conducted on the impact of ISO14001 profitability. If so this study has engaged to know whether ISO 14001 certification is helpful on profitability and social benefits after certification or not in the case of Ethio- leather industry (ELICO)

1.3 Objective of the study

General objective: - general objective of the study is to investigate the impacts of ISO14001 certification on profitability and examine the benefits of iso14001 certification in Ethio-leather industry and for the surrounding society.

Specific Objectives are

- To assess the impact of ISO 14001 on profitability, in case of Ethio-leather industry.
- To examine the benefits of adopting the ISO 14001 standard to the surrounding society

-To investigate problems related to the implementation of ISO14001 certification in etho-leather industry.

1.4 Working hypothesis

The following are the working hypothesis of the study.

Hypothesis1. ISO14001 certification has positive impact on firms' profitability

Hypothesis2. ISO14001 certification has benefit to the surrounding society.

1.5 Significant of the study

The study had some findings related to the impacts of ISO14001 on profit maximization and other social benefits. These findings will be useful for policy makers of environmental protection and leather industries especially for ELICO. It can be helpful for ELICO in several ways like to evaluate their profitability before and after certification and improve the company environmental management system. In addition to this the study can provide information and create awareness about ISO14001 environmental management, ISO14001 financial benefit and other social benefits to uncertified industries.

1.6 Limitation of the study

During this study the researcher faced limitations such as time, resource and collaboration. Also the study is only considered two industries in ELICO not all certified leather industries in Ethiopia.

1.7 organization of the study

The study has five chapters. The first chapter deals with the introductory part; like background of the study, the statement of the problem, objective of the study, working hypothesis, significant of the study and limitation of the study. The second chapter deals with review of the previous literature that consists of theoretical reviews and empirical results of prior studies. Chapter three is concerned with research methods, data source, method of data collection, sampling design and description of the variables has been explained. In the fourth chapter, data presentation, discussion of the results and hypothesis test is presented. The final chapter deals with conclusion of the study and recommendation of the study based on the findings

CHAPTER TWO

2. Review of literature

2.1Theoretical review

2.1.1 ISO, ISO 14000 and ISO 14001

ISO stands for the international organization for standardization, located in Geneva, Switzerland. ISO promotes the development and implementation of voluntary international standards, for both particular products and for environmental management issues. ISO 14000 refers to a series of voluntary standards in the environment develop by ISO. From 14000 series ISO 14001 is one of them. It is total quality management (TQM) business concept of continuous improvement (Salman, undated).

According Gbedemah (2004) the main purpose of ISO 14001 standards is to provide a clear evidence of relationship between organization's stated environmental policy and the implementation of this policy. All the ISO standards are developed trough a voluntary, consensus-based approach. Each member country of ISO develops its position on the standards and these positions are negotiated with other member countries. Draft version of the standards sent out to each member countries to vote on the draft. With in each country, various types of organizations participate in the process including nongovernmental organizations (NGOs). For example MEF participates in the development of ISO 14001 standards (MEF, 2012).

ISO 14001 is intended to provide organizations with elements of an effective environmental management system directly and create better financial performance indirectly. Its aim is to support environmental protection and prevention of pollution in balance with socio economic activities. Also ISO 14001 describes how an organization might manage and control its organizational systems. So that it measures, control and continually improve its environmental aspects of its operations (Edwards et.al, 1999).

2.1.2 ISO 14000 series

The following are lists of ISO 14000 series of standards as explain in (ISO, 1996) Gbedemah (2004) and (Bügler, 2011).

ISO 14001- Environmental management systems—Requirements with guidance for use. It provides the guidelines for an ISO 14001 EMS. It provides companies with a framework for incorporating environmental considerations into every aspect of their operations.

ISO14002 - (Environmental Management Systems – General Guidelines on Principles, Systems and Supporting Techniques) is the companion piece to ISO 14001. It provides guidelines and examples of different methods for creating an EMS and meeting the requirements of ISO 14001. Although it used as a Guideline on Special Considerations Affecting Small and Medium Scale Enterprises and it is not certifiable.

ISO14010- (Guidelines for Environmental Auditing: General Principles of Environmental Auditing) defines key terms and describes general auditing objectives, criteria, and practices.

ISO14011- (Guidelines for Environmental Auditing: Auditing Procedures Auditing of Environmental Management Systems) provides guidelines for the auditing process, including preparation, execution and reporting of the audit.

2.1.3 Rationale of ISO14001 certification

Firm's main rationale for the certification of ISO14001 is its worldwide acceptance to facilitate their trade by harmonizing environmental management standards and better economic performance, pollution prevention and compliance assurance. Environmental issues are becoming more complex and become an important factor in the decision-making process of companies. Reducing pollution means increasing efficiency and wasting fewer resources. Improved health and safety conditions result in a more productive workforce. Supplying goods and services that respect the environment helps to expand markets and improve sales. In short, companies become more competitive when they practice good environmental management (www.ni-environment.gov.uk, 2009). On the other

hand as and Darnall (2001) explained, with any financial or commercial risk, only a well-founded and properly implemented management approach can provide a measure of confidence that good performance is not an accident and that poor performance can be identified and rectified. By properly implementing an appropriate environmental management system (EMS), any company, large or small, can ensure that they effectively manage environmental risks while identifying and exploiting the myriad opportunities proper environmental management can bring. For this and other reasons industries registered ISO14001 certificate.

2.1.4 Motivations and benefits of ISO certification

Currently many industries in the world are acquiring ISO14001 certification to get worldwide acceptance of their products. Also firms are practicing ISO14001 to avoid potential export barrier and to create market advantage. In developed countries there is high need of environmental protection and management; because of these firms have high customer pressure to take different action that can be helpful to environmental improvement. In addition to these reasons firms are motivated to the ISO14001 certification to cost reduction purpose, to create butter public relation and to quality improvement (B ELLE S, 2005)

2.1.5 ISO 14001 certification requirements

Organizations to be certified of 14001certification, they should identify the environmental aspects of their activities, products or services and to achieve its result impact on the environment. They have to set their targets and objectives for controlling their activities negative impact and for improving environmental performance. Based on this ISO 14001 specify requirements that must meet by one industry in order to achieve certification by the certification body (Whitelaw, 2004). Some of the requirements of certification as (Ellis, 2006) explained are the following.

- ✓ Development of environmental policy
- ✓ Identification of environmental aspects and evaluation of associated environmental impacts.

- ✓ Establishment of relevant legal and regulatory requirements.
- ✓ Development and maintenance of environmental objectives and targets.
- ✓ Implementation of documented system, including elements of training, operational controls and dealing with emergencies.
- ✓ Monitoring and measurement of operational activities
- ✓ Environmental auditing
- ✓ Management review of the system to ensure its effectiveness and suitability.

2.1.6 Advantages of ISO 14001 certification

ISO14001 certification has environmental and business benefits to the certified industries. As stated in Gbedemah (2004) and Corbett and Russo (2001) some of ISO 14001 certification benefits are the following. Since one's industry certified, its activity will also evaluated by the third party. This action make organizations committed to improve environmental performance and this results in greatest positive impact to the environment and reduction of hazardous through reuse and recycling of wastes, this implies that ISO certification maximizes natural resource use. It improves the relationship between the industries and the regulator because the agency knows that the certified organization care for the environment. It leads long term cost saving in the area of environmental control and cleans up incidents and it can create customer trust and satisfaction. The customers fell more secure that the environment is being created for. Also it increases market share and create market access all over the world of the certified industries' product if most customers are environmental conscious, especially in advanced countries. In addition to these advantages, ISO14001 is helpful to technology development and improve community relationship of the certified companies.

ISO 14001 certification is important to the certified companies in regard to create better financial benefits throughout the production process as in Bejarano (2002) stated. It reduces energy consumption, improvement of industries' insurance rates, and reduction in cost of package, reduction in cost of emission, discharge and waste handling.

2.1.7 Disadvantages of ISO14001 certification

ISO14001 certification has its disadvantages such as high cost of certification and implementation; it may result in reduction of resource away from investment. It also added bureaucracy during its implementation. Although the standard directs an organization to make environmental policy available to the public, the National Pollution Prevention Round table found that "the standard does not require sufficient public disclosure of a firm's environmental Impact. There are differences in the definitions of pollution prevention in ISO 14001 and the Pollution Prevention Act. The Pollution Prevention Act defines pollution prevention as source reduction with recycling and treatment as less desirable "end-of-pipe" alternatives whereas ISO considers recycling and treatment as pollution prevention. The implications of this difference are that any entity adhering to ISO 14001 must be mindful of the differences between the regulations to which it is subject and the ISO guidelines and address them.

2.1.8 Environmental management system (EMS)

Before discussing what EMS is it is important to know what environment, environmental management and management system is.

As ISO (1996) definition Environment is "the surrounding which an organization operates including air, water, land, natural resource, flora, fauna, human and their interrelation''.

And an Environmental management is to control the activities one might undertake; in order to sustain physical resource and avoiding polluting them.

According to Wellge (2009 environmental management system (EMS) is a set of process and practice that enables the organization to reduce its negative environmental impact and to maximize its operating efficiency. It is a voluntary management system for identifying, controlling and monitoring the organizations' activity which leads potential environmental impact (Zobel, 2005). And the ISO 14001 standard define EMS as overall management system which includes the organizational structure, planning activists, responsibilities, practice, procedures, process and implementation of environmental policy(ISO1996)cited in

Gbedemah (2004). Adopting of an EMS not only focus on a company attention on negative environmental impact. But also it insures responsibility to maintain high environmental standards (Morrowand et al., 2002). As Wellge (2009) explained, EMS integrates environmental issue with all organizational activities. It is a set of intensive managerial processes which require the company to measure and control its environmental impact. The implementation of EMS not only enables fulfill legal requirements, but it also motivates to take over additional duties concerning the environment.

According to ISO 14001 EMS have four components. These are plan, DO, check and act. If the cycle is achieved constantly, it leads to continuous Improvement of the system (ISO, 1996).

2.1.9 Comparisons of ISO 14001 and ISO 9001

ISO 9000 and 14000 families are the most widely known standards in the world. ISO 9001 has become an international reference for quality management requirements and ISO 14001 for environmental management. ISO 14001use the same fundamental system as 9000 such as documentation control, management system auditing, operational control, control of records, training and corrective and preventive action(zailani and Ann, undated). But according to an article published by Isis and David (1995) ISO 14001 does not replace ISO 9001.

Besides the similarities, they have also differences. ISO 14001 has clear statement about communication and compliance. In addition to this ISO 14001 incorporates setting of objectives, targets and emergency preparedness. It also considers other parties views and public discloser of the environmental policy. The ISO 9000 family is concerned with quality management, to do this one organization must fulfill the customers quality requirement and applicable regulatory requirements aiming to enhance customers' satisfaction and achieve continual improvements of its quality performance in the pursuits of its objectives as (Aros, 2006) stated.

The ISO 14000 family is primarily concerned with environmental management. This means one ISO 14001 certified industries try to minimize harmful effects on

the environment that caused by industries activities and to achieve continual improvement of environmental performance.

2.1.10 Impacts of ISO14001 on Profitability

Profitability is the financial return and it is the important source of finance for any business. Thus, by increasing production, saving energy, saving raw material and reducing operational and maintenance cost can generate more profit to those organizations that adopts ISO EMS. As K.G.A.S and G.W.H (2011) stated, ISO14001 has positive effect on market value of firms after they receive it. Also the study conclusion shows that if it is correctly developed and implemented, ISO EMS may have tangible gain and rewards. Some of the rewards are increase accesses to capital, operational cost saving, reduce insurance premium, protect human health and the environment, increase market share, and maintain good public relation and it increases competitiveness.

McGuire et al. (1998) found that firms with higher social responsibility toward environmental issues gained higher the value of return of asset (ROA) and stock-market. Obtaining an official certification of ISO 14001 can significantly improve the image of the firm to the public than having a proprietary EMS can. Indeed Bansal (2003) suggested that if a company is operated with higher environmental impact with opacity, the company would be likely to have ISO 14001 to send positive signals about positive environmental activities to the public.

In the resource base view, resources can be classified as tangible or intangible. ISO 14001 can be considered an intangible resource. For such intangible resource to be lead to be competitive resource, it was shown that the greater involvement of external stakeholder influence on the results (Delmas, 2001). His study viewed the environmental management system as one of the organizational capability to be competitive. Also the study examined impact of environmental management on firm's performance and it suggested that improved environmental management can help a company to accomplish more market gains and more cost saving. It was proposed that such advantages within a company also finally lead financial

performances to be improved. In Arimura, et al. (2008) study relating to the cost saving effect of ISO14001, it was witnessed that ISO 14001 have impact on natural resource use, solid waste generation, and wastewater effluent. It was shown that a facility adopting ISO 14001 has reduced negative environmental impacts in Japan.

The achievement of the certification of ISO 14001 also increases the value of return on asset of the firms Kang(2010) stated that along with the satisfaction about demand for positive environmental activities of the public through the achievement of ISO 14001 certification. Companies would have additional chances to sell their products more than before certification. For example, large companies have encouraged their suppliers to achieve ISO 14001, suppliers would have additional chances to contact other customers demanding suppliers satisfying environmental standards in order to make production process to be smooth or improve company's social responsibility

2.1.11 ISO14001 Certification Advantages to ELICO industry

ISO14001 has many advantages to ELICO Company. It changes company image and it develops the confidence of customers. ISO used to meet legal and other requirements and address compliance from the surrounding society. Through implementation of ISO14001 EMS ELICO brings technology improvement and improve resource consumption pattern such as water, electricity and other inputs. ISO avoided business obstacles that rise from the customers and increase workers motivation and workers safety guard.

2.2 Empirical Literatures

There are several empirical studies that are conducted in different countries on the impact of ISO 14001 certification on environmental performance, firms profitably and other social certification benefits.

As Zailani and Ann (2010) investigate ISO14001 EMS using bivariate correlation analysis, it enhances economic performance through energy consumption, raw material input waste management. The research conducted on Ford Company using times series data OLS regression shows that after the company receives ISO14001 certification, the company water usage reduced by 2.4 million gallons. In addition to this improvement, recycling wastes after certification in the company improved by 22% than before certification.

According to Badar and Aba literature review research (2010), the impact of ISO14001has has been very positive. More than 50% of the certified companies that participated in the ISO14001 Impact assessment believed that ISO saves money and it help them to increase their product quality, sales and market share. Also Johnson (1997) explained in his research using descriptive method of analysis show that ISO builds a single global management system that allows for effective management of environmental responsibilities. It also reduces liability; control costs and foster a firms concern for the public. ISO14001 has the potential to lead competitive advantages for the businesses in areas such as enhancing raw materials and strengthening supply management.

The study administered on Malaysia small and medium scale enterprise by Nee and Wahid (2010) using DID impact assessment methodology examines the relationship between ISO 14001 EMS implementation and Malaysian small and medium scale enterprises' performance shows that ISO 14001 implementation has positive impact on SMEs performance. The research conducted on 61 ISO 14001 firms conclude that ISO 14001 implementation has positive and significant relationship with the firms' operation performance and business performance.

The research conducted by Edwards et al (1999) in United States using time series data by Appling OLS regression shows that ISO14001impelementation has

financial impact on organizations is financial gain. In terms of short-term financial gain, the data suggests that the implementation of ISO 14001 EMS does not directly enhance certified firms' financial performance. But in the long- term it increases their competitive advantage. Specifically, 59% of the respondents' organizations suggest that their firm had ''increased'' or ''slightly increased'' their competitive advantage. In addition to this, ISO14001 certification "increased" or'' slightly increased" access to new market for 44% firms out of the total.

The study conducted in Brazil by Ferron et al(2012) Using OLS regression analysis by a applying DID on firms profitability due to IS14001 certification shows that ISO EMS certification improves profitability and this reflected by the gain of higher net income after certification. Firms with ISO14001 increase their net income (profitability) by 24.6% higher than firms that without EMS certification. This implies that firms that adopt EMS certification tend to increase their economic benefits.

Another study was performed in Brazilian market by Rodrigues and Ferreira (2006) using OLS regression by Appling DID impact assessment method on the profitability of Brazilian steel makers that obtained ISO 14001certification indicated a positive relation between Environmental management and the financial indicators of these firms. According to the authors, the results in general indicated that ISO 14001 EMS certification has positive impact on firms' profitability, environmental management, and better resource utilization and so on. This study also conducts the impact of ISO14001 certification on profitability and social benefit using DID impact assessment methodology.

CHAPTER THREE

3. Methodology

The purpose of the study was to investigate the impact of ISO14001 certification on profitability and its social benefit, specifically ELICO leather industry profit performance. In addition to these, the study assessed the benefit of ISO14001 certification on the surrounding society including ELICO workers. The research has been conducted on three ELICO's industries; namely Abyssinia tannery, Universal leather and Awash tannery taking Addis Ababa tannery as a control group. Addis Ababa tannery was selected.

To investigate ELICO's ISO14001 certification impact on its profitability, ordinary least squares (OLS) econometrics model using multivariate regression analysis has been applied using some profit determinant variables like export volume, total factors productivity, foreign exchange rate, lag vales of profit, lag value of export lag value of factors productivity and ISO14001 certification . Here, profit taken as dependent variable and all other variables were treated as independent variables. Also ISO14001 is dummy variables (it took the value of 1 after certification and 0 before certification to the treatment group and 0 for control group). In addition to regression analysis, descriptive statistics like mean and variance is applied to compare semiannual profit change before and after certification using fourteen years data.

To investigate ISO14001 certification benefit on surrounding society and their perception towards ISO14001 certification, the study used descriptive statistics such as mean and percentage method of analysis. To collect the data that was used to study the ISO14001 certification on stockholders benefit, sample of the surrounding society and ELICO workers has been taken. To do this, questionnaire was used as a method of data collection.

For the third objective, investigation problems related to the implementation of ISO14001 certification in Etho-leather industry, the data was collected using interview of the top management and descriptive method of analysis was applied.

3.1 Sources of data

The study used both primary and secondary data. The primary data has been collected using interview of the top management and questionnaire of ELICO's workers and the surrounding society. The secondary data was collected published and unpublished sources of ELICO and Addis Ababa tannery. To investigate the impact of ISO14001 certification on profitability, secondary data that are available during and after certification of ISO14001 from ELICO document has been taken. To analyze ISO 14001 certification on social benefit and social perception, primary data has been collected using questionnaire from ELICO workers and the surrounding society. For analysis of ISO14001 implementation Problems, primary data has been collected using interview of the top management.

3.2 Sampling design

To investigate the effectiveness of ISO14001 on stakeholders benefit and to collect their perception about ISO14001 implementation effect, simple random sampling technique was used. The sample was taken from the surrounding household and ELICO workers and primary data was collected through self administered questioner. Both Awash and Abyssinia tannery have around 1000 workers. Out of 1000 workers 80 of them were randomly selected. Around the factories 530 households are living. From these households 150 were randomly selected for the study.

3.3 Model specification

Impact evaluations estimate average impacts of a program on the welfare of beneficiaries**.** The main role of impact evaluation is to produce evidence on program effectiveness for the use of government officials, program managers, civil society, and other stakeholders. To estimate the average impact of an intervention, there are different types of tools and Difference in Difference (DID) is one of them.

DID impact evaluation method compare the changes in outcomes over time between the treatment group the comparison group. As World Bank (2011) stated in its impact evaluation handbook, the treatment and comparison groups do not necessarily need to have the same pre intervention conditions. . To apply difference-indifferences, all that is necessary is to measure outcomes in the group that receives the program (the treatment group) and the group that does not (the comparison group) both before and after the program.

According to Meyer et al (1994), this statistical model requires controlling for the effect of the event (treatment) on other variables. This is done by attributing the number zero to the group before treatment or experiencing an event and the number one after treatment or experiencing the event (where the event is obtaining certification). According to Coelho et al (2011), when using the difference in differences approach, which compares the change in the results of the treated group before and after the intervention with the change in results of the control group over the same interval, the researcher manages to control unobserved factors that vary with time. I addition to this, difference-in-differences method helps resolve this problem to the extent that many characteristics of units or individuals can reasonably be assumed to be constant over time (or time-invariant). DID is formulated as $\Delta\Delta Y = \Delta Y_t - \Delta Y_c$

$\Delta Y_c = Y_{c2}-Y_{c1}$ and $\Delta Y_t = Y_{t2}-Y_{t1}$

$\Delta\Delta Y$ = net impact of the intervention on treatment group

$Y_{c2}-Y_{c1}$ = change of control group without intervention

Y_{t2}-Y_{t1} = change of treatment group with intervention

Difference in difference (DID) impact evaluation methodology was used to measure ISO14001 impact on Etho-leather industry profitability. The study used OLS econometrics model taking the semiannual profit as dependent variable. The model is formulated as follows.

$$P_{ti} = \beta_0+\beta_1 x_{ti}+ \beta_2 tp_{ti} + \beta_3 fx_{ti} +\beta_4 p_{t-1i}+ \beta_5 tp_{t-1i} \beta_6 x_{t-1i}+ \beta_6 iso14001+\varepsilon_{ti}$$

ISO14001 take the value of 1 after certification for the treatment group and 0 before certification and have the value of 0 for the control group.

P_t = semiannual profit

X_t =semiannual export volume

Fx =semiannual foreign exchange rate

Tp = semiannual total factors productivity

t- Represents time (time series data)

i-Represent the company group (treatment and control group)

ε_{ti} – error term

Here difference in difference compares the changes in outcomes over time between a company that is certified of ISO14001 (the treatment group) and accompany that is not certified (Comparison group).

DD impact = (B − A) − (D − C)

Where - A= the average profit of treatment company before certification

B= the average profit of certified company after ISO 14001 certification

C= the average profit of control group before certification

D= the average profit of control group after certification

Also the definitions of variables are expressed as follows. Export represents semiannual export volume of each company before and after certification year. Also lagexport, dexport, dlagexport and d2lagexport represents lag value semiannual export volume, difference value of semiannual export, difference value of lag value of semiannual export and double difference of lag value of semiannual export respectively. Total factor productivity is the sum of all factor productivities like labor, land, and capital and entrepreneurship skill. It is symbolized by Dtp(dtotalp), dlagtotalp and D2lagtotalp. They represent Dtotalp represents the difference value of total factors productivity, difference of lag value of total factors productivity and double difference of total factors productivity respectively. Foreign exchange rate is the exchange rate amount of dollar against dollar. The researcher takes the semiannual average value of exchange rate from the year 1999-2012. Forex and dforex represents the average semiannual exchange rate and difference value of average semiannual exchange rate. Also profit, dprofit and dlag profit represents semiannual profit, difference value of profit and lag value of semiannual profit.

CHAPTER FOUR

4.1 Result and Discussion

4.1.1 Impacts of ISO14001 on profitability

ISO14001 environmental management certificate has an indirect impact on a certified company in many ways. One certified company can increase its profit by increasing its sales volume in local and international market. Since ISO14001impelementation leads better environmental management and improves the quality of the product, the certified company can sale its product at higher price than uncertified company. Also ISO certification is important to avoid international trade barriers and is helpful to meet customers' requirement.

4.1.1.1 Data description of treatment group

Table 4.1 variables description of treatment group

Before certification	Variables	Min value	Max value	Average value
	Profit	2,168,115	10,912,165	3,701,021
	Foreign exchange rate	7.302	8.635	8.356
	Export volume	15,985,551	53,867,900	30,986,702
	T. factors productivity	37,965,856	42,978,748	40,551,011
After certification	Profit	6,640,812	79,675,936	32, 787,693
	Forex	8.652	17.628	11.656
	Export volume	27,894,544	98,930,248	52,861,878
	T. factors productivity	40,218,688	98,983,896	69,546,647
Mean difference	profit	Foregone exchange	export	Total factors productivity
	29, 086672	3.3	21,875,176	28, 995636

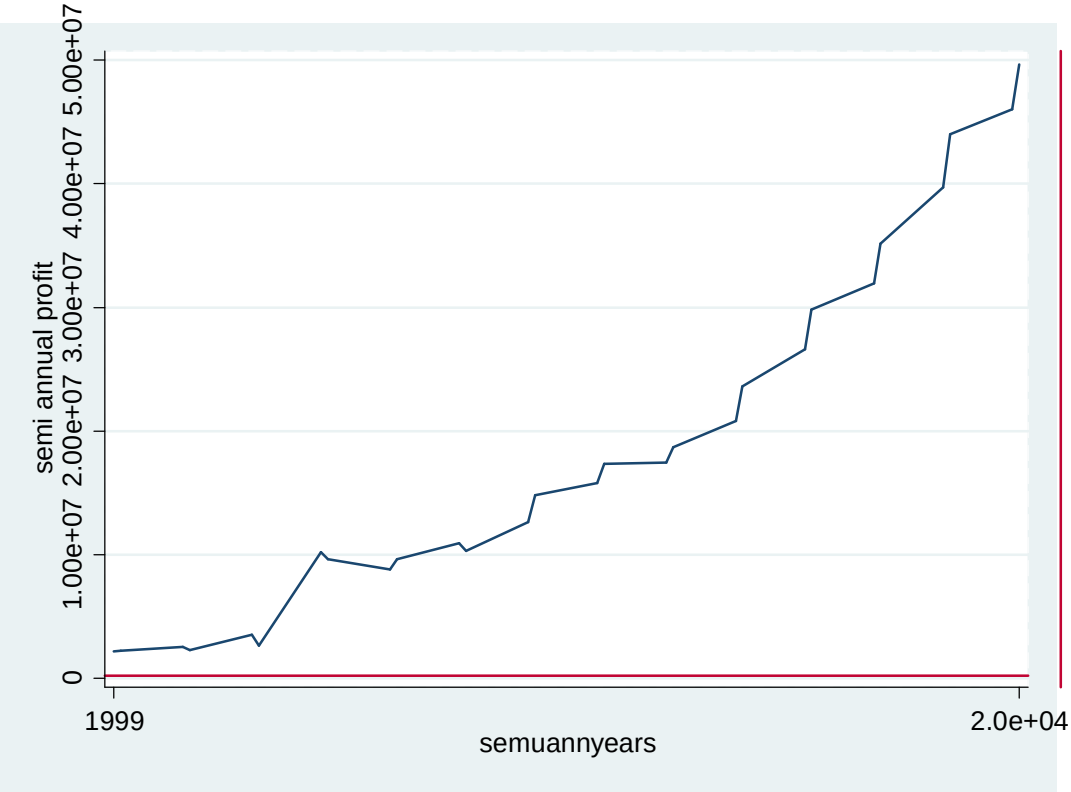
Source: NBE and ELICO

The treatment group (ELICO) had 3,701,021 birr semiannual average profit with a minimum semiannual profit of 2,168,115 birr and maximum semiannual profit of 10,912,165 birr before certification. Also the mean semiannual export volume of ELICO was 30,986,702 birr with 15, 985,551birr minimum and 53,867,900 birr maximum export volume. Before ISO certification, ELICO had an average semiannual total factors productivity of 40,551,011 with 37,965,856 and 42,978,748 birr minimum and maximum respectively. The national bank of Ethiopia foreign exchange record shows that from 1999-2005 the semiannual average foreign exchange was 8.356 with the minimum of 7.302 and maximum of 8.635 exchange rate. If the exchange rate of birr against dollar increases from time to time it increases the total revenue generated from export products and hence it increase the profit amount.

After ELICO certified ISO14001 the mean semiannual profit is 32, 787,693 birr and it has 6,640,812 birr and 79,675,936 birr minimum and maximum semiannual profit respectively. The mean semiannual export volume after certification is 52,861,878 birr and it has 98,930,248 maximum and 27,894,544 minimum export volume in birr. The mean semiannual total factors productivity of the company is 69,546,647 birr with 40,218,688 birr and 98, 983,896 birr minimum and maximum total factors productivity respectively. Starting from 2006- 2012, the mean semiannual foreign exchange rate is 11.656with minimum of 8.652 and maximum of 17.628 foreign exchange rate.

Mean difference is calculated as mean after ISO certification of the variables minus the mean before ISO certification. From table 4.1 we can see that there is a change on all variables after ISO certification. The mean difference of ELICO profit is 29,086,672 birr, total factors productivity and export volume has the mean difference of 21,875,176 and 28, 995636 birr respectively.

Figure 4.1 profit growth trend from year 1999- 2012



Source: own drawing

From figure 4.1 we can see that the trend of profit before certification was increased slightly or sometimes it had been decreases because of market price variation from time to time and lack of demand.

4.1.2 Econometrics Analysis

4.1.2.1 Statistical test of the variables

A. stationary test

If variables can't be co integrated each other after testing stationary and there is a unit root, then the next step is differencing each variable till they become stationary. To test stationary Augmented Dickey–Fuller unit-root test is used. Dickey–Fuller argues that if the absolute value of test Statistic of the variable or the differenced variable is greater than the Dickey–Fuller value at 1%, 5% and

10% critical values, the variable or its difference value is said to be stationary at the given order of difference.

Appendix four shows that before the certification year semiannual profit, Total factors productivity, Lag value of profit and Lag value of Total factors productivity are stationary after they make 1 time difference. Foreign exchange rate, Export volume and lag value Export volume are stationary without difference.

After certification years the control group variables such as semiannual profit, Foreign exchange rate and Lag value of profit are stationary without any difference. But other variables like Export volume, Total factors productivity, lag value Export volume and Lag value of Total factors Productivity is stationary after differencing them one time. For more information look at appendix five.

From treatment group variables before certification year only foreign exchange rate is stationary without any difference. Semiannual profit, export volume, total factors productivity are stationary at first order difference. Lag value of Total factors productivity and lag value of Export is stationary at second order difference and Lag value of profit is stationary after differencing it four times. Augmented Dickey–Fuller unit-root test of treatment group after certification year show that semiannual profit group is stationary without any difference. Lag value of profit and lag value of export volume become stationary after differencing two times and all other variables are stationary at first order difference. For more information the test result is available at appendix six and appendix seven respectively.

B. multicollinearity test

To check sever multicollinearity in the model, correlation coefficient between explanatory variables have been tested for both control and treatment group.

From appendix eight to eleven shows that the values of all correlation coefficients between the explanatory variables it is below 0.80. So there is no severe multicollinearity between the explanatory variables.

C. model specification

There are a couple of methods to detect specification error. From these methods, linktest command is one of them. Linktest method is based on the idea that if a registration is properly specified. Linktest creates two new variables, the variable of prediction – the hat and the variable of hat squared prediction hat square. If our model is specified correctly, hat should be significant and hat square shouldn't be significant predictor. The result is available at appendix twelve.

D. homoscedesticity

To test the availability of homoscedesticity (constant variance), Breusch pagan test is used. Appendix thirteen shows that the probability of all models is greater than 0.05 we can accept the null hypothesis that says there is constant variance.

4.1.3 Regression result of the models

Table 4.2 regression result of control group before certification

Prob >F = 0.0239		**R-squared =0.9682**		**R-squared =0.9682**		
Variables	coef	Std. Err.	t	P>t	95% conf. interval	
Dprofit						
forex	2240747	761048.9	2.94	0.060	-1812498	4662745
dtp	-.2205171	.0387337	-5.69	0.011	-.3437851	-.097249
Export	.9151959	.4901799	1.87	0.159	-.6447754	2.475167
Dlagprofit	-.3338226	.2009851	-1.66	0.195	-.9734468	.3058015
Lagexport	-2.524902	.4580172	-5.51	0.012	-3.982517	-1.067287
dlagtp	-.1286818	.059853	-2.15	0.121	-.3191614	.0617978
cons	-16967	592.8	-2.86	0.065	-35856437	1906939

Durbin-Watson =1.716373						

Source own computation

From table 4.2 we can see that the probability of F statistics is 0.0239 which means all explanatory variables are jointly significant. The adjusted R^2 of the model which is 0.90 shows that about 90% of the dependent variable explained by the listed independent variables. Also the rho value shows that the model is fitted since the value is less than one which is 0.673. To check autocorrelation test Durbin-Watson is used. To test the control group model before certification, the researcher takes the sample of twelve half years data and six explanatory variables. For this case du value is 2.665 and 4-du is 1.335 and d value is 1.716 which shows that there is no autocorrelation between the error terms of the disturbance. From the listed independent variables foreign exchange rate, total factors productivity and lag value of export volume are significantly affecting the dependent variable at 5% level of significant. The constant term is also significant at 10% level of significant and export volume, lag value of profit and lag value of total factors productivity are not significant individually. The control group regression result before certification result shows that foreign exchange rate and semiannual export volume have positive relation with semiannual profitability. Total factors productivity, lag value of profit, lag value of export and total factors productivity have negative relation with Addis Ababa tannery semiannual profit. When we come to interpretation if semiannual exchange rate dollar with birr changed by one unit, on average semiannual profit will change by two million two hundred forty thousand and seven hundred forty seven birr and profit change by two and half birr if lag value of export change by one unit. If total factors productivity change by one unit, profit will change by 0.22 unit and profit change by -.1286818 units if lag value of total factors productivity change by one unit. Also if export volume change by one unit on average profit is changed by 0.9151959 and profit also change by 0.3338226 unit if lag value of profit changed by one unit.

Table 4.3 regression result of control group after certification

Prob>F 0.0318		**R-squared =0.7654**		**Adj. R-squared = 0.5644**		
Variables						
profit	coef	Std.err	t	P>t	95% conf.interval	
dexport	14.36137 5	.301422	2.71	0.030	1.825503	26.89725
dtp	-.02442661	.04543	-0.02	0.982	-11465807	17861789
dforex	116914	4886447	0.02	0.982	-11465807	17861789
lagprofit	-.55509	.26056	-2.13	0.071	-1.171238	.0610467
dlagtp	-4.525766 1	.144535	-3.95	0.006	-7.232162	-1.81937
dlagexport	25.07919	5.820084	4.31	0.004	11.31688	38.8415
cons	3308793	5067516	0.65	0.535	-86739786	15728957
Durbin-Watson		1.646185				

Source: own computation

The regression result of Addis Ababa tannery after 2005 is presented at table 4.5. As given in table 4.3 adjusted R^2 is 0.564 and R^2 0.765 this means that 56.4 percent of the model is explained by the combination of the given independent variables. Also Durbin-Watson autocorrelation test shows that the value d lies between dl and du or between (4 - *d*u*)* and 4 – *dL* this shows that D.W test is inconclusive. From these variables semiannual export volume, lag value of total factors productivity and lag value export volume are significantly affect the company profit. Also lag value of profit is also significant at 10% level of significant and other variables such as lag value of factors productivity, foreign exchange rate and the constant term are significant variables. But the F statistics of the model is 0.0318 which means the explanatory variables affect the

dependent variable jointly at 5% level of significant. Regarding to variables relationship, export volume, foreign exchange and previous value of export volume affects the semiannual profit positively and semiannual total factors productivity, previous value of profit and lag value of factors productivity have negative relationship with the semiannual profit. The regression result of Addis Ababa tannery after 1995 shows that, if lag value of profit change by one unit, on average semiannual profit change by 0.555 unit. When we come to export volume if it changes by one unit profit change bye 14.36 unit and it changes by 25 unit if lag value of export volume change by one unit. If foreign exchange rate change by one unit, on average profit change by 116,914 units and it have big impact on profit performance of the company. Also if total factors productivity and lag value of total factors productivity change by one unit profit can be affected by 0.024 unit and 4.525 respectively.

Table 4.4 regression result of treatment group before certification

Prob > F = 0.0063		**R- Squared= 0.652**		**Adj R-squared = 0.598**		
Variables	coef	Std.err	t	P>|t|	95% conf. interval	
semiprofit						
forex	901925.1	151174	5.97	0.026	1018923	2822773
dexport	.0695622	.0477347	1.46	0.383	- .5369653	.6760897
dtotalp	1.241611	.680943	3.82	0.019	7.41059	9.893812
d4lagsemipt	-1.040045	.8345707	-1.25	0.430	-11.64427	9.564181
d2lagexport	.0105475	.0167327	0.63	0.642	-.2020613	.2231563
d2lagtotalp	2.406238	.4277451	5.63	0.012	7.8412	3.0287
_cons	21142569	512354607	0.42	0.718	-24835408	202589408

Durbin-Watson statistic (original) = 1.74

Source: own computation

As we can see in table 4.4 the overall significant of the model is checked by R^2 (0.652) which means that about 65.2% of the model is explained by the listed independent variables. The explanatory variables are jointly significant at 1% percent level of significant. Also the autocorrelation test Durbin-Watson statistics shows there is no autocorrelation of the disturbance since d (1.74) lie between 4-du (1.336) and du (2.664.). When we come to each explanatory variables significant level, foreign exchange rate, factors productivity and previous value of factors productivity coefficients are significant at 5% level of significant. Export volume, previous value of profit and previous value of export volume are not significant explanatory variables. Regarding to explanatory variables relationship with the independent variable, all variables except lag value of semiannual profit have positive relation with the dependent variable. If lag value of semiannual profit change by one unit, profit change by 1.04 units and it changes by 901,925.1 units if foreign exchange rate change by one unit. Also if export volume change by one unit, profit increases by 0.0695 unit and it increase by 0.011 unit if lag value of export change by one unit. In addition, semiannual Profit change by 1.24 and 2.41 if total factors productivity and lag value of total factors productivity change by one unit respectively.

Table 4.5 regression result of treatment group after certification

Prob > F = 0.0145		**R-squared = 0.9252**		**Adj R-squared = 0.8206**		
Variables						
semiprofit	Coef	Std. Err	t	P>|t|	95% Conf. Interval]	
dforex	2185275	5150461	0.42	0.689	-11158672	15407264
dexport	.1692668	.2157721	0.78	0.468	-. 3853932	.7239267
dtotalp	-.0152548	.0624025	-0.24	0.817	-.1756655	.1451558
d2lagsemipt	3.314427	1.25541	2.64	0.046	.0872918	6.541561
iso2	3874413	6047573	0.31	0.769	-13725427	17075812

dlagtotalp	1123394	1577463	0.71	0.508	-.2931603	.517839
d2lagexport	.2180516	.2009155	1.09	0.327	-.2984181	.7345214
_cons	882950	4079579	2.18	0.081	-1603941	1258940
Durbin-Watson statistic (original) 1.671022						

Source: own computation

The autocorrelation test of the model of treatment group after certification shows D.W test is inconclusive since the value of d lies between dl and du or between (4 - du) and (4) - dl. As given in table 4.7 R^2 value is 0.925 this indicates that about 92.5% of the dependent variable is explained by the explanatory variables. The joint significant of the independent variables 0.0145 which is less than 0.05 this shows that the explanatory variables are jointly significant at 5% level of significant. All other variables do not have significant impact on profit. Except previous semiannual total factors productivity coefficient, all variables have positive relation with profit of ELICO. Here the lag value of profit has significant impact on its current value of profit. If lag value of profit change by one unit, profit change by 3.314 unit and profit change by 2,185,275 unit if foreign exchange rate change by one unit. If export and lag value of export change by one unit profit changes by 0.1693 and 0.218 unit respectively. If total factors productivity change by one unit semiannual profit change by 0.0153 and it changes by 0.1123 if lag value of total factors productivity change by one unit. The researcher target variable ISO 14001 is not significant but it has positive impact in semiannual profit of the treatment group. The exact impact of iso14001 on profitability is calculated as follows.

$$P_{ti} = \beta_0+\beta_1 x_{ti}+ \beta_2 tp_{ti} + \beta_3 fx_{ti} +\beta_4 p_{t-1i}+ \beta_5 tp_{t-1i}\ \beta_6 x_{t-1i}+ \beta 7\text{iso14001} +\varepsilon_{ti}$$

This is general form of the model both companies.

$$P_{tc1} = \beta_0+\beta_1 x_{tc1}+ \beta_2 tp_{tc1}+ \beta_3 fx_{tc1}+ \beta_4 p_{t-1c1}+ \beta_5 tp_{t-1c1}+ \beta_6 x_{t-1c1}+\beta_7 \text{iso14001}+\varepsilon_{tc1}$$

C1 represents the time before certification year to the control group

$P_{tc1} = -16967+0.915x_{tc1}-0.221tp_{tc1}+2240747fx_{tc1}-0.333p_{t-1c1}+ 0.1287tp_{t-1c1}- 2.523x_{t-1c1} +\varepsilon_{tc1}$

$P_{tc1} = -16967+0.915(1168474)-0.221(12137821) +2240747(8.356)-0.333(1937877) +0.1287(12000417)-2.523(1063739)$

$P_{tc1} = -16967+1069389-2682458.8+18723681.9-645313-1544453.6-2683813$

$P_{tc1} =12,220,066.1$

$P_{tc2} = \beta_0+\beta_1x_{tc2}+ \beta_2tp_{tc2} +\beta_3fx_{tc2}+ \beta_4p_{t-1c2}+ \beta_5tp_{t -1c2} \beta_6x_{t-1c2}+\beta_7iso14001+\varepsilon_{tc2}$

C2 represents the time after certification year to the control group

$P_{tc2} = 3308793+ 14.36 x_{tc2}-0.024tp_{tc2}+ 116914fx_{tc2}-0.555p_{t-1c2}+ 25.079tp_{t-1c2}-4.525x_{t-1c2} +\varepsilon_{tc2}$

$3308793+14.36(3168045)-0.024(20885054)+116914(11.656)$
$0.555(4094045) + 25.079(2837088) - 4.525(19876561)$

$P_{tc2} = 28,601,133.9$

$P_{tT1} = \beta_0+\beta_1 x_{tT1}+ \beta_2tp_{tT1}+ \beta_3fx_{tT1}+ \beta_4p_{t-1T1}+ \beta_5tp_{t -1T1}+ \beta_6x_{t-1T1}+\beta_7iso14001+\varepsilon_{tT1}$

T1 represents treatment group before certification year

$P_{tT1} =21142569+0.6956 x_{tT1}+ 1.242tp_{tT1}+ 901925.1fx_{tT1}-1.04p_{t-1T1}+ 2.406tp_{t -1T1} +0.011x_{t-1T1} +\varepsilon_{tT1}$

P_{tT1} =21142569+0.6956(30986702) +1.242(40, 552011) + 901925.1(8.356) -1.04(3520103) +2.406(40331398.5) + 0.011(31503054)

P_{tT1} =97,284,629

$P_{tT2} = \beta_0+\beta_1 x_{tT2}+ \beta_2 tp_{tT2}+ \beta_3 fx_{tT2}+ \beta_4 p_{t-1T2}+ \beta_5 tp_{t-1T2}+ \beta_6 x_{t-1T2}+\beta_7 iso14001+\varepsilon_{tT2}$

T2 represents treatment group after certification year, here ISO 14001 takes the value of one

P_{tT2} = 6882950+0.169 x_{tT2}-0.0153tp_{tT2}+ 2185275fx_{tT2}+ 2.314p_{t-1T2}+ 0.1123tp_{t-1T2}+ 0.218x_{t-1T2}+ (1) iso14001+ε_{tT2}

P_{tT2} = 6882950+0.169 952861878 0-0.0153(69546647) + 2185275(11.650) + 2.314(29661810) + 0.1123(67584163) + 0.218(49790613) + (1) iso14001+ε_{tT2}

118,108,123.65

The net impact of ISO14001 on ElICO Company profit is

{[Average value of semiannual profit of treatment group after certification – average value of semiannual profit of treatment group before certification]-[average value of control group semiannual profit after certification –average value of semiannual profit of control group before certification]}

{[(118,108,123.65-97284629)-[28,601,133.9-12,220,066.1]}

4,442,427.85

After ELICO received ISO14001 certificate on average its semiannual profit is increased by 4,442,427.85. This shows that ISO14001 certification has positive impact on firms' profitability.

4.2 Stakeholder Analysis and Perception

4.2.1 Stakeholder Analysis and Perception of ELICO

Stakeholders can be divided in to two, Primary stakeholders and secondary stakeholders. Primary stakeholders are those that first affected by the project. These include individuals, group and organizations. Secondary stakeholders are government, NGO's and other private organizations.

The neighboring community, management team and employees are primary stakeholders of ELICO. In ELICO the management team allocates resource for development and implementation of EMS to reduce the environmental impact of the factors s' activities. The company EMS implementation is mainly conducted by employees of the factories. The neighboring community is also get advantage from the implementation of EMS through reduction of waste realized especially wastewater to Akaki River that can affect them. Also the positive effect of implementation of EMS is higher for primary stockholders than the secondary stockholders. Stakeholders' analysis is important to decide how each stakeholder can participate on in implementation and effectiveness of EMS.

4.2.2 Perception of ELICO Workers

To know the perception of ELICO workers on effectiveness of ISO 14001 EMS environment performance, data was collected through self administered questionnaire. From the total of 80 questionnaires 72 are collected effectively and used to analysis their perception.

From 72 respondents/employees 51 are male and 21 are female 70.8 percent and 29.2 percent respectively. The respondent have more than 7 years of experience, have different educational level and position in different departments of the factories.

Table 4.6 education level of respondents

	Education level	Frequency	Percent

valid	Grade 9-12	15	20.8
	College diploma	32	44.4
	Degree & above	25	34.7
	Total	72	100

Source: primary data

From table 4.6 most of the workers are diploma and degree graduated 32% and 25% respectively. The workers level of education also affects the effectiveness of EMS on environmental performance because the workers can understand each procedures implementation during work. Also in addition to their educational level, most of the workers (80.5%) are work more than 8 years and they are experienced. This experience help them to develop better awareness and about ISO EMS implementation the factories.

Also the employees were asked the difference between before and after ISO 14001 certification on their working condition like hazards that face them during work such as toxic elements and other hazards. 61% workers replied that before ISO certification there was different chemical hazards like burning of skin during work. Before certification there was no procedure about chemical handling and care procedures during use of chemicals. Also there was no safety material during chemical use and chemical transport.

But after certification this human damage is avoided and there is a procedure that helps workers to how can they handle and transport chemicals. During chemical use and transport workers are using different wearing safety equipments that are helpful to protect them from chemical burn. And 44% of the workers said that before certification there was high amount of dust during buffing process. These exposed them to respiratory system problems and lead air pollution. But after certification the factories construct dust collector and avoid hazards that were raised from dust pollutions. 56% of the workers argued that before ISO certification and implementation, the factories release chrome and other waste

waters without any treatment to the river. Also there was no measurement of their toxic level during emission. Because of these there was human and plants damage, soil, air and water pollution. But after certification there is chrome recycles that can help to reuse the used chrome and there is also wastewater treatment in both tanneries.

The employees were also asked their awareness about environmental management system. 60 of seventy two or (83.3%) respondents replied that before ISO EMS implementation there was no identification of aspects and impacts that can highly affect the environment i.e. workers, plants, the surrounding society and others.

After certification there is identification of aspects and impacts and the factories are trying to mitigate/avoid their production negative impact on the environment. To achieve these factories are trying to create high awareness about environmental stewardship through training and other meetings. 55%of the workers argued that after certification the factories are properly identifying aspects and impacts raised from their production activate. Also 12 of the workers (16.7%) replied that after certification there is training given by the factories about EMS implementation an environmental protection programs that can help them to have better awareness about environment.

Also as the workers replied the management team is considering the environmental management as part of their work. The management team is trying to create environmental stewardship to employees. 94.4% of the respondents (68 of them 72)replied that before ISO EMS implementation the factories were violate environmental laws and regulations and now they are trying to fulfilling the laws and regulations set by MEF. In addition to better environmental performance implementation of EMS, employees of the factories are realizing different environmental and economical benefits. This benefit includes workers insurance, loan to workers and other benefits are some of them.

Table 4.7 benefit after ISO certification

	Frequency	Percent
training benefit	12	16.7
loan benefit	2	2.8
workers insurance and health service	4	5.6
other benefits	2	2.8
All	14	19.4
Training, loan and health service	6	8.3
Loan, workers insurance and health service and other benefits	7	9.7
Training, workers insurance and health service, and other benefits	14	19.4
Training and other benefits	3	4.2
Loan and other benefits	1	1.4
Workers insurance and health service	1	1.4
all except other benefits	3	4.2
nothing got	3	4.2
Total	72	100.0

Source: primary data

From table 4.7 we can realized because of ISO14001 and other management change, ELICO employees got some benefits like training benefit (16.7%), training benefit workers insurance and health service, (19.4%) and training benefit, workers insurance and other benefits (19.4%) are contain higher value of the benefits percentage. Other benefits worker get include benefits from the factories profit because of high volume of sales, better job security, physiological freedom, clean working environment and better salary are some of the benefits.

During working hours different accidents like fire, chemical spilling are the major hazards. Before ISO 14001 implementation the factories took different measure to reduce incidents like fire and chemical spilling. But the methods were traditional and there was no preventive measure. But after EMS implementation to reduce or

avoid different accidents and its harmful effects, the factories trying to take different measures in modern way. 22% of the workers (16 of 72) replied that if any incident or accident happen, first they register the accident and then they try to make root cause analysis and take corrective based on ISO procedure. Also through training the factories are trying to train the workers how they can stop the accident when it happens.

51.4% (36 of72) of the workers replied that the factories are taking preventive action to avoid or minimize different accidents. From these preventive actions place fire extinguisher at each place, there are procedures to chemical handling, less contamination of working area with chemicals and others are some of them. Even after the accident has happened, there is medical services given in the compound and there is also 12 hours health insurance provided by ELICO.

To improve implementation and effectiveness of ISO 14001 EMS, ELICO workers give different recommendation. 58.3% (42of 72) workers recommended that these must be advanced training to the employees. Also lack of better technologies is one problem to make ISO not to be effective. 45.8% (33of 72) of the employees suggests that there must be better implementation of the plan and there must be follow up or commitment of EMS or EMR team to realize better environmental performance.

To investigate the effectiveness of ISO 14001 EMS implementation on environmental performance, question is founded to the employee of the company. Table 4.8 contains the summary of this.

Table 4.8 effectiveness of ISO 14001 implementation

	Frequency	**Percent**
Yes	65	90.3
No	7	9.7
Total	72	100

Source: primary data

From table 4.8 we can see that 90.3% (65 of 72) employees respond that ISO14001 implementation in this company is effective on environmental management. And only 9.7 % (7of 72) workers argued that ISO14001 implementation is ineffective on environmental management. Some of its effectiveness is the following. 57% of the respondents believe that because of ISO14001 implementation, the working areas is clean from contamination of different toxic chemicals since they are working following ISO procedures. Also the factories are developing green working compound/ areas.

87.5%(63of 72) of the workers replied that because of ISO14001 implementation, damage on plants, animals, soil, air and water pollution is decrease more than 60% because of recycle toxic chemicals like chrome, dissolved chemicals according to ISO 14001 procedures, availability of effluent treatment in the factories and other prevention actions. In addition to this treatment of wastewater, as 72% of the workers replied, based on the companies aspect and impact identification plan and control and measurement action, the factories have avoid solid wastes dumped around the compound and the community. Also as they replied pollution from gas waste and air pollution from dust particles are decreasing from time to time. After ISO implementation both factories are trying to fulfill legal and other requirements and it helps the factories avoid using of highly toxic chemicals.

4.2.3 Perception of the surrounding society

To collect information from the surrounding society to know their perception 150 questionnaires were distributed and 140 were effectively collected. From the respondents 57.1% (80 of140) are male and 42.9(60 of140) are female respondents. Most of the respondents live in that area for more than 10 years. The first question forwarded for these community members were to explain the major waste discharged from the factories that has significant impact on environment i.e. including health problems before certification. The following table illustrates this.

Table 4.9 before ISO certification waste discharges

	Frequency	**Percent**
Waste water	95	67.9
Gas waste	4	2.9
Solid waste	2	1.4
All	15	10.7
Wastewater and gas waste	17	12.1
Waste water and solid waste	7	5.0
Total	140	100

Source: primary data

Table 4.9 shows that before certification of ISO 14001, 67.9 % respondents replied that the factories mostly discharged waste was wastewater. 12.1% respondents replied that there was high wastewater and gas emission and 10.7% respondents argued that there was emission of wastewater, solid waste; gas waste before EMS implementation.

These listed wasted affects the neighboring community. The waste water pollutes Akaki River and it has bad odor. 78.6% respondents explained that especially the waste water affects their health; different disease like cold, tuberculoses and different infection disease, Respiratory system problems, headache and skin disease are some of them.

Also the gas waste emission leads high environmental pollution and the acidic vapor affects their properties like tin. They observed that the wastewater was killed plants and decrease soil fertility.

After the factories start to implement EMS, both factories are trying to control their emission and toxicity level. The neighboring communities also argued on its

trail to decrease its emission. 55% of the respondents argued on the factories action to reduce its waste within the least seven years and other 45% respondents replied that the factories are do nothing to minimize their emission level and its bad odor from waste water emission.

Table 4.10 action to waste emission after ISO14001 implementation

	Frequency	Percent
Yes	77	55
No	63	45
Total	140	100

Primary data

As respondents explain the factories effort to decrease their emission after EMS implementation is helpful to the factories to their solid wastes management. After certification the company dumps its solid waste to on other place and their gas emission level is significantly decreasing. In addition to this to decrease their waste water bad odor, they released it through covered tube and use different treatment chemicals that can decrease its toxic level after ISO implementation.

Table 4.11 waste reduction after EMS implementation

	Frequency	**Percent**
Waste water	52	37.1
Gas waste	14	10.0
Solid waste	4	2.9
All	6	4.3
Wastewater and gas waste	1	0.7
Gas waste and solid waste	1	0.7
Wastewater and solid waste	5	3.6
No reduction	57	40.7
Total	140	100

Source: primary data

Table 4.11 shows that 37.1 (52 of 140) respondents replied that wastes in form of wastewater are decreasing and 14 and 4 respondents replied that gas waste; solid waste are also decreasing after EMS implementation respectively. 40.7% (57 of 140) respondents argued that there is no reduction even if there is EMS implementation.

Table 4.12 benefits from waste reduction

	Frequency	**Percent**
Yes	66	47.1
No	74	52.9
Total	100	100

Primary data

The respondents who are argued on the reduction of waste discharge, they also explained the benefit waste reduction in the community. 47.1% (66 of 140) respondents explained that waste reduction and waste treatment especially wastewater have many advantages for their communities because of better waste management decrease its toxic level. Because of waste reduction the surrounding society is getting different benefits. Also because of the factories avoid their solid water emission around the community their environment is better clean than before.

4.3 Investigating problems related to the implementation of ISO14001 certification in ETHO-leather industry

To investigate the obstacles that ELICO face during ISO implementation, interview of the top management was held. Some questions are forwarded to EMS representative of ELICO. As the informant person explains the obstacles some of them are the following.

-Lack of management commitment –the effectiveness of ISO14001 EMS is highly dependent on the top management commitment. During realization of ISO the management may not allocate enough resource to implement ISO. These resources include time, money, trained personnel and different facilities. To bring

better environmental performance there must be management review to evaluate the level of performance at annual basis.

- Confusion – before ISO14001 certification, ELICO was ISO9001 certified. When ISO14001 begin implement the employees of ELICO were confused about the difference between ISO9001 and ISO14001 implementation.
- Expectation benefit - worker are expecting some economical benefits from implementation of ISO. Most of the worker correlate ISO implementation with only financial benefits but mainly it deals with environmental issues. Even if it has financial benefits, it may not reach to all workers. This expectation make workers to be reluctant to work based on the ISO procedures.
- Lack of knowledge - there is awareness gap or problem during training. Some worker want work based procedures that were adopted before ISO implementation. Sometimes they are not willing to adopt innovations and they have negative attitude towards ISO implementation.
- The implementation may not show its effectiveness in short period of time. If this happen the management is reluctant to follow up its implementation since its environmental benefit takes long time.
- Communication problem – as informant person explain there is a communication problem with both external and internal stakeholders. Especially the surrounding society, they do not recognize the company effort positively. Because of this, they do not give any support to the company. Also chemical suppliers sometimes supply hazardous chemicals to the company. Since the company do not have the facilities to check its hazardous level on the environment, it is difficult to meet suppliers who can supply the suitable chemical.
- Cleaner production option (CPO) - CPO is the part of EMS but the company did not recognize its vital role way of implementing EMS properly. To apply CPO, there is lack of team work and lack of resource to apply it.
- Difficulties with achieve targets, objectives and programs. For example there is air pollution that rose from co, co_2, so_2 from furnace oil burn. To measure its aspect and impact and to deal with its remedial measure, there is no any

measurement facility and it is not addressed in leather industries how to measure it and mitigate it.

- Less recognition of the company - companies that implement ISO EMS should have to get better recognition than non certified companies. In addition to this there must be reward to those companies that work with EMS and worker who shows better effort to ISO implementation.

- High turnover of the employees – high turnover of the employees leads low improvement of the system. Because training to new employees have high cost and it takes time and elongates the production hours.

- Unavailability of trained or skilled labor force – skilled labor force is necessary to make better improvement of EMS. There is lack of skilled labor force especially who work on recycling and reuse of wastes.

In addition to the top manager ELICO workers also explain some of the obstacles related to EMS implementation. 42 of 72 (58.3) of the workers explained that tanning needs better technology and there is lack of technology in ELICO, these technology includes skilled labor force, modern machineries and different facilities. Also they argued that high cost of better treatments and unavailability of some facilities are reasons for obstacles to implement ISO EMS. Also 34 of 72(47%) of the workers replied that the major obstacles the company face during realization of ISO1400 EMS are poor management commitment to plan implementation and low knowledge and stewardship of the employees to the environment.

The second question forward to ELICO management is to explain the possible solution to the obstacles listed in question one. The following are some of the solutions for the listed obstacles. The company is adopting new form of work Kaizen, which is a system of continuous improvement in quality, technology, processes, company culture, productivity, safety and leadership. It can be helpful to improve the awareness of workers and can bring better EMS implementation.

Also from time to time the management commitment to follow-up and revising EMS implementation is improving. Other than the top management, one question is forwarded to ELICO workers using questioner related to the solution to the obstacles that ELICO face. 44 of 72 (61%) of the workers replied that there must be additional motivational training to the workers and there must be better duty free technology since cost of modern machines is high the government must have cooperate do import duty free machines. Other 21 of 72 (29%) workers argued that there must be also better management commitment to apply each EMS elements based on the procedure and to achieve the company EMS targets, objectives and programs. In addition to these suggestions they also recommend that there must be government follow up and it can be helpful do communicate each other pollution related problems and its solution.

CHAPTER FIVE

5. Summary and Recommendation

5.1 Summary

Generally the study analyzed the relationship between the profitability of firms (impacts of ISO14001on firm's profitability), ISO EMS certification benefit to other stakeholders and problems related to ISO14001 implementation. The researcher use both econometrics and descriptive statistical way of analysis. To investigate the impact of ISO14001 EMS certification on firm's profitability DID experiment design has been selected. Also f OLS econometrics model have been used. To do this the researcher takes semiannual profit as dependent variable and total factors productivity, semiannual average foreign exchange, semiannual export volume and lag value of both dependent and independent variables except lag value of foreign exchange rate. The result shows that obtaining ISO14001 EMS certification has positive impact on profitability. As the result calculated in chapter four, at each semiannual, on average, the profit of the certified company increased by four and half million birr. This shows that ISO14001 EMS certification has positive impact on certified firm's profitability.

The stakeholders' perception about the emission of the factories waste shows that there is decrease in emission of solid, gas and wastewater discharges. The result of the study shows that most of the company employees argued that ISO14001 EMS implementation helps them to protect from different hazards. Also EMS implementation helps the company to avoid using highly toxic chemicals and releasing its waste after treatment. Other than this environmental performance benefits, ELICO employees got different benefits like economical and training benefits. The perception of the surrounding society is also shows that there is waste emission reduction and because of the reduction as society is benefited from the waste emission reduction and the company is taking different action to reduce its waste emission.

Regarding to ISO14001 implementation problems, since it is new phenomenon to the developing world, it faces many problems. During ISO implementation ELICO faces Some of the following obstacles like lack of competence, communication problem, difficulties with achieve targets, objectives, and programs, less recognition of the certified companies, high turnover of the employees, awareness problem related to environmental conservation and protection and its benefit.

5.2 recommendations

Based on the findings, the researcher recommended to the certified companies to adopt ISO 14001 in more effective way to have better financial performance to get more market share internationally. For the uncertified companies it is better to receive and adopt ISO14001 EMS to avoided barriers related to environmental issues and have better recognition by their customers. If they do this they can even they can have better share of foreign market and can sell their products at better price and they can improve their profitability.

To avoided or minimize ISO14001 implementation obstacles the researcher forward the following recommendations to the certified company. Since training is the main way to create awareness about ISO4001 development and benefit, the company has to give more advanced training to its workers and the company has to create better motivation to workers to better implementation of ISO EMS based on the company plan. Also there must be government or MEF follow up of the certified companies. This follow up includes providing the companies with different supports like duty free import of treatment plant, different machineries and other supports because of that tanning industry needs lots of chemicals' treatment machines. In addition to these the company should improve its communication with internal and external stakeholders. It would helpful to better implementation of EMS and has to minimize its employee's turnover to minimize its EMS training cost and to make continual EMS development by giving different incentives to the employees including award and other.

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APPENDIX

Appendix one- questioner and interview

My name is Mekdes shewangizaw and I am postgraduate student at university of Gondar. My research title is "ISO 14001 certification effectiveness on environmental management and profit (case study of Etho-leather industry, Addis Ababa Ethiopia)". The main purpose of this questionnaire is investigating the result of ISO14001 certification on the stakeholders' benefits (ELICO workers and the surrounding society). This questionnaire will be important to investigate benefit of ISO14001 EMS implementation on you and your surrounding society. So the following questions are forwarded to you. Please answer them correctly, thank you for your cooperation.

1. Personal information

-

- Education level

2. How many years do you live here?
3. What is the major waste discharges released from Awash or Abyssinia tannery that has significant impact on the environment and your health before the company certified ISO14001? List the form of the wastes
   - In form of water waste
   - In from of solid waste
   -in form of gas
4. How could the wastes you list in question no.3 affect you and your community? Please list the negative effects you face

   1. 3.

   2. 4.

   Others

5. Did the company take any action to reduce its waste within the last seven years?

Yes no

6. If your answer is yes for question No 5, what types of action it takes to reduce its waste? Pleas list some of them

-

-

7. Do you realize the waste release decrement after ISO14001? Yes no
8. If your answer is yes, in which form of waste decrement you realized?
   -In form of water waste
   - In from of solid waste
   -in form of gas
9. After 1998 or ISO14001 certification, do you realized any environmental management change compared to the years before ISO14001 certification? Yes no
10. If your answer to No 9 is yes, please list some of the changes.

-

-

-

10. What is your benefit from the better environmental management changes you list in No 10? Please list them

-

-

11. .in addition to environmental benefits, do you realized any community or personal economic benefit? If there is please list them

-

Question forward to ELICO worker

My name is Mekdes shewangizaw and I am postgraduate student at university of Gondar. My research title is “ISO 14001 certification effectiveness on environmental management and profit (case study of Etho-leather industry, Addis

Ababa Ethiopia)". The main purpose of this questionnaire is investigating the result of ISO14001 certification on the stakeholders' benefits (ELICO workers and the surrounding society). This questionnaire will be important to investigate benefit of ISO14001 EMS implementation on you and your surrounding society. So the following questions are forwarded to you. Please answer them correctly, thank you for your cooperation.

1. Personal information

- Gender male female
- Education level
-

2. How many years do you work in ELICO?
3. Is there any difference on your working condition before and after ISO14001 EMS implementation such as suffering of workers from toxic elements and other hazards?

Before certification	after certification
-	-
-	-
-	-
-	-

4. Is there any benefit you get or realized from your company as a result of ISO14001 certification? If there is please tick on it.
   - Training benefits
   -loan to workers
   - Workers insurance and health service
   -Other benefits _____
5. Did you face any hazard before ISO14001 implementation during the production process? If there was, please list them
   -

-

-

6. What measures the company has taken to reduce or avoid the harmful effects that happen during production process?
7. What must to do to improve your working condition and avoid hazards that happen during production process?

Do you think that ISO14001 implementation in your organization is effective on environmental management? Yes no

8. If your answer for question NO 8 is yes, please explain ISO14001 effectiveness on environmental management.
9. What are the obstacles related to ISO14001 implementation in your company?
10. What is the solution for the obstacles you list in question No 9?

Interview

The following questions are forwarded to the top management to investigate the obstacles that ELICO face during implementation of ISO14001.

1. What are the major obstacles the company faces during ISO implementation that leads less effectiveness of an environmental performance?
2. What is the solution to those obstacles you list in question number one?
3. Do you think that the management is most committed to impalement ISO properly and make it effective?
4. Do you think that the training given to the employees of the company is enough?
5. How much yearly budget the company assigns to the implementation of ISO?
6. Is there any way that the Ethiopian cleaner production centre (ECPC) has involved in realization of the company EMS?

   Do you contact any NGOs like UNIDO to get different supports to improve environmental performance?
7. What are the major factors that increase your company profit?

8. What are major factors other than ISO that affects your company sales volume?

Appendix two - ELICO DATA

years	Foreign exchange rate	Semi annual PROFIT	Export volume	Total product
1999(1)	7.302	2168115	21458836	37765856
19999(2)	8.12	2199764	25052872	38515156
2000(1)	8.2	2554638	20421312	35638872
2000(2)	8.22	2251034	15985551	37850944
2001(1)	8.42	3502198	53867900	39824680
2001(2)	8.46	2612118	46475064	42940728
2002(1)	8.543	10214335	36119916	45638372
2002(2)	8.566	9644317	34923632	47850944
2003(1)	8.581	8793512	32798944	57791800
2003(2)	8.6	9610828	30972632	60049928
2004(1)	8.635	10912165	28456944	69204512
2004(2)	8.63	10291119	25306826	71578752
2005(1)	8.652	27894544	27894544	46199820
2005(2)	8.66	30684234	30684234	51738384
2006(1)	8.681	32172412	32172412	40218688
2006(2)	8.69	34026956	34026956	46093728

2007(1)	8.794	35893592	35893592	48347688
2007(2)	9.03	37329080	37329080	90186840
2008(1)	9.244	48101244	48101244	75518224
2008(2)	9.61	48449764	48449764	71041576
2009(1)	10.4205	33465488	33465488	62668420
2009(2)	11.3009	41906508	41906508	64554636
2010(1)	12.8909	45373536	45373536	78349512
2010(2)	13.5321	46796392	46796392	76413624
2011(1)	15.5115	76973808	76973808	80453288
2011(2	16.7512	80200168	80200168	93390624
2012(1)	17.0994	95824960	95824960	98983896
2012(2)	17.628	98930848	98930248	79245608

Appendix three - Addis Ababa tannery

Years	Profit	export	Total product
1999(1)	734729	816652	9578392
19999(2)	863692	1013189	0421608
2000(1)	1602145	1102341	10251474
2000(2)	515605	916476	12936697

2001(1)	498775	1372125	13301547
2001(2)	608495	1178918	12208885
2002(1)	487699	987689	12042389
2002(2)	337799	1333299	11167422
2003(1)	254965	1112348	12997589
2003(2)	276837	1175919	13885089
2004(1)	72919	1362167	13213502
2004(2)	82799	1000599	13649258
2005(1)	1408857	1395611	14872932
2005(2)	1162221	1541676	16496448
2006(1)	794573	1789732	18458374
2006(2)	947256	1490066	15339613
2007(1)	72415	1474147	10886849
2007(2)	72778	820720	12061839
2008(1)	611367	3101509	22057964
2008(2)	588510	2903398	19974750
2009(1)	360474	3004464	21531024
2009(2)	458754	3416428	20036856
2010(1)	133412	3110329	18593808
2010(2)	932047	3192581	22359864
2011(1)	18908	4120312	22400000
2011(2	21046	5064066	24901850
2012(1)	2691439	6131279	35102288
2012(2)	2408706	8132405	36220856

Appendix four – stationary test of control group before certification year

Variables	Test Statistic	p-value	No. difference to make stationary
Profit	-2.766	0.0632	1
Foreign exchange rate	-7.362	0.0000	0
Export volume	-3.228	0.0184	0
Total factors productivity	-3.253	0.0171	1
Lag value of profit	-2.701	0.0635	1
lag value Export volume	-3.831	0.0026	0
Lag value of Total factors productivity	-2.909	0.0443	1

Appendix five - stationary test of control group after certification

Variables	Test Statistic	p-value	No. difference to make stationary
Profit	-3.721	0.0038	0
Forex rate	-4.489	0.0000	0
Export volume	-3.092	0.0271	1
T. factors productivity	-3.514	0.0076	1
Lag value of profit	-3.581	0.0061	0
lag value Export	-3.944	0.0017	1
Lag value of t. factors productivity	-2.710	0.0723	1

Profit	-10.538	0.0000	1
Foreign exchange rate	-7.362	0.0000	0
Export volume	-33.017	0.0000	1
Total factors productivity	-4.132	0.0003	1
Lag value of profit	-3.101	0.0265	4
lag value Export volume	-2.776	0.0096	2
Lag value of Total factors productivity	-2.894	0.0251	2

Appendix six- stationary test of treatment group before certification

Variables	Test Statistic	p-value	No difference
Profit	-8.426	0.0000	0
Foreign exchange rate	-4.489	0.0000	1
Export volume	-14.399	0.0000	1
Total factors productivity	-4.007	0.0141	1
Lag value of profit	-25.503	0.0000	2
lag value Export volume	-2.750	0.0520	2
Lag value of T factors prdct	-2.730	0.0410	1

Appendix seven- stationary test of treatment group after certification

Appendix eight - multicollinearity test of control group before certification

	Dprofit	Forex	export	Dtp	D lag pr	Lag ex	Lag tp
Dprofit	1						
Foreign exchange rate	0.5945	1					
export	0.4869	0.774	1				
Dt.factories productivity	-0.66	-0.283	-0.3677	1			
D lag profit	-0.0246	0.304	0.5621	0.164	1		

Lag export	-0.1457	0.7661	0.777	-0.276	0.5847	1	
Dlagt. factories productivity	0.287	-0.0109	-0.1476	-0.131	-0.662	0.4914	1

Source: own computation

Appendix nine- multicollinearity of control group after certification year

	Dprofit	Forex	export	Dtp	D lag pr	Lag ex	Lag tp
Dprofit	1						
Forex	0.2604	1					
export	0.184	0.113	1				
Dtotal p	-0.0901	-0.150	0.62	1			
D lag profit	-0.376	-0.128	0.219	0.589	1		
Lag export	0.2415	0.048	-0.026	0-0.1456	0.249	1	
Dlagtotal p	-0.0705	0.062	0.434	-0.6141	0.0963	0.7776	1

Appendix ten- multicollinearity test of treatment group before certification

	Dprofit	Forex	dexport	D4tp	D 4lag pr	Lag ex	Lagtp
Dprofit	1						
Forex	0.0997	1					
dexport	0.091	-0.210	1				
Dtotal p	0.452	-0.082	-0.128	1			
D 4lag profit	-0.376	0.226	-0.133	0.748	1		
D2Lag export	0.503	-0.144	-0.403	-0.293	-0.428	1	
D2lagtotal p	0.171	0.080	0.101	0.158	-0.153	-0.107	1

Source: own computation

Appendix eleven- multicollinearity test of treatment group after certification period

	profit	dforex	dexport	Dtp	D2lagprofit	D2Lagexport	dLag tp	ISO14001
Profit	1							
d Forex	0.2711	1						
dExport	0.1306	0.409	1					
dTotal p	0.1410	0.348	0.244	1				
D2Lagprofit	-0.623	0.026	0.030	-0.108	1			

D2lag Export	0.425	0.203	0.117	0.030	0.032	1		
dLag Total	0.0877	-0.180	0.217	-0.0114	0.236	0.059	1	
ISO14001	0.682	0.0124	0.571	-0.119	0.349	0.264	-.105	1

Source: own computation

Appendix twelve- model specification test

		p. value
Control group before certification	hat	0.000
	hatsq	0.320
Control group after certification	hat	0.000
	hatsq	0.100
Treatment group before certification	hat	0.000
	hatsq	0.62
Treatment group after certification	hat	0.000
	hatsq	0.239

Source: own computation

Appendix thirteen- homoscedesticity test

	Chi^2	Probability
Treatment data after certification	2.49	0.1142
Treatment data before certification	2.32	0.342
Control data after certification	2.76	0.0900
Control data before certification	6.67	0.4125

Source: own computation